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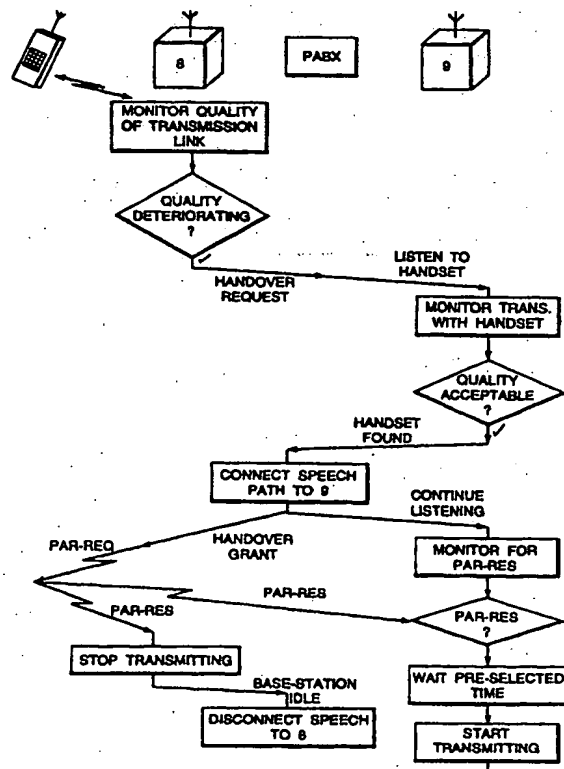
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(54) Title: CORDLESS TELECOMMUNICATIONS HANDOVER

(57) Abstract

In a cordless telecommunications system a call carried by a first radio link between a first base-station and a cordless handset may be transferred to one carried by a second radio link between a new base-station which is one of a plurality of frame synchronised base-stations and the cordless handset, the base-stations being connected to a Private Automatic Branch Exchange PABX, by carrying out the steps of: (i) the first base-station monitoring the quality of the first radio link, and upon deterioration of the link-sending a first message to the PABX, (ii) the PABX upon receipt of the first message initiating monitoring of the quality of radio transmissions from the cordless handset by the base-stations, (iii) a new base-station detecting a radio link from the handset whose quality exceeds a predetermined value sending a second message to the PABX, and (iv) the PABX connecting the call from the handset to the new base-station in parallel with the first base-station, and then transferring transmission between the first and second radio links.



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CORDLESS TELECOMMUNICATIONS HANDOVER

The present invention relates to a cordless telecommunications system in particular to cordless telephone apparatus comprising a cordless handset and base-station conforming to the European Telecommunications Standards Institute (ETSI) I-ETS 300 131 R1. This standard, which is incorporated herein by reference, is for radio equipment and systems and provides a common air interface specification to be used for the interworking between cordless telephone apparatus in the frequency band 864.1 MHz to 868.1 MHz, including public access services.

In a cordless telecommunications system a network of base-stations are provided which communicate, by means of a radio link, with the cordless handset. For a given call the base-station, usually the one geographically closest, will communicate with the cordless handset. The strength of the radio link with a given base-station will depend upon the location of the cordless handset which being mobile may change during a call. It is therefore desirable during a call to switch, or handover, the call between base-stations to ensure the radio link with the handset is of an acceptably high standard. It is an object of the present invention to provide a method for handover between a cordless handset and a burst synchronized base-station conforming to I-ETS 300 131 R1 in which neither a change of radio channel nor burst structure is necessary.

Accordingly the present invention provides in a cordless telecommunications system a method of transferring a call carried by a first radio link between a first base-station and a cordless handset, to one carried by a second radio link between a new base-station which

is one of a plurality of frame synchronised base-stations and the cordless handset. the base-stations being connected to a Private Automatic Branch Exchange PABX, comprising the steps of;

- (i) the first base-station monitoring the quality of the first radio link, and upon
5 deterioration of the link sending a first message to the PABX,
- (ii) the PABX upon receipt of the first message initiating monitoring of the quality of radio transmissions from the cordless handset by the base-stations,
- (iii) upon a new base-station detecting a radio link whose quality exceeds a predetermined value sending a second message to the PABX, and
- 10 (iv) the PABX connecting the call from the handset to the new base-station in parallel with the first base-station, and transferring transmission between the first and second radio links.

Preferably the cordless telecommunications system operates according to I-ETSI 300 131 R1 and the transfer of transmission between the first and second radio links includes
15 the first base-station transmitting a PAR_REQ to the cordless handset, in response the cordless handset transmitting a PAR_RES, the first base-station ceasing transmission and the new base-station transmitting after a pre-selected delay.

A method of performing the invention will now be described by way of example only with reference to the accompanying drawings in which :-

20 Figure 1 is a schematic representation of a cordless telecommunications system and

Figure 2 is a flow chart of the handover method in accordance with the present invention.

Figure 1 shows a schematic representation of a cordless telecommunications system,

which comprises a telecommunications network 1 which is typically a Public Switched Telephone Network (PSTN), although in the future an Integrated Services Digital Network (ISDN) may be more common. The telecommunications network 1 is connected to Private Automatic Branch Exchanges (PABX's) 2 which themselves control a plurality of CT2 base-stations 4 (CT2 - Cordless telephones of the second generation conforming to I-ETS 300 131 R1) of a cordless telephone apparatus. Each PABX 2 is connected to the telecommunications network 1 by a network link, which will typically include some or all of a wired link, an optical fibre link or a long distance radio link.

As shown in Figure 1 the cordless telephone apparatus, to which the present invention relates, comprises a plurality of base-stations 4 and a cordless handset 6. The cordless handset will typically be a telephone handset for speech communication but can also comprise a facsimile machine or other data communicating device. The handset 6 communicates with the base-station 4 over a radio link 7. The base-stations 4 are arranged to provide overlapping radio zones ensuring that a radio link 7 will always be available regardless of the geographic location of the cordless handset 6. In this way a user of the handset 6 has access to any other cordless handset, or conventional telephone 3, connected to the telecommunications network 1.

Although Figure 1 shows a single handset 6 communicating with a given base-station 4, a plurality of handsets could be simultaneously communicating with a single base-station using different radio channels. As the user of the handset moves away from the base-station the strength of the radio link within the zone covered by the base-station will weaken. There will come a point where the radio link would be stronger with the base-station in a neighbouring zone. At this point it is desirable to transfer, or Handover, the

radio link to the new base-station serving this zone to maintain transmission quality.

A method of Handover in accordance with the invention will be described with reference to Figure 2. Figure 2 is a flow chart for the handover operation between a first base-station and a new base-station in a neighbouring zone.

5 The first base-station which has an established call with the handset continuously monitors the quality of the radio link. When the first base-station detects a trend of deteriorating quality in the radio link it requests Handover of the PABX to which it is connected. It does this by sending a first message, or **Handover Request**, to the PABX which message includes the Portable Identification Code (**PID**) or serial number of the
10 handset, the radio channel currently in operation and the multiplex (**MUX1.2** or **MUX1.4**). All of the terms are defined in I-ETS 300 131 R1.

 The PABX in response to the **Handover Request** sends a message, referred to as a **Listen to Handset**, to base-stations in neighbouring zones initiating the base-stations to monitor the quality of radio transmissions from the handset. The **Listen to Handset** also
15 includes the same information as the **Handover Request** that in **PID**, radio channel and multiplex. Since the base-stations in the neighbouring zones are frame synchronised they are able to detect and decode transmissions from the handset on the specified radio channel in the appropriate multiplex. If the **PID** contained in the **ID_OK** matches the **PID** in the
 Listen to Handset the base-station continues monitoring the quality of transmissions from
20 the handset for a short period, typically five seconds. This new base-station then sends a **Handset Found** message to the PABX if the quality of the transmission link exceeds a pre-selected threshold. The **Handset Found** message contains the **PID** of the handset.

 In response the PABX sends a message to the first base-station to continue listening

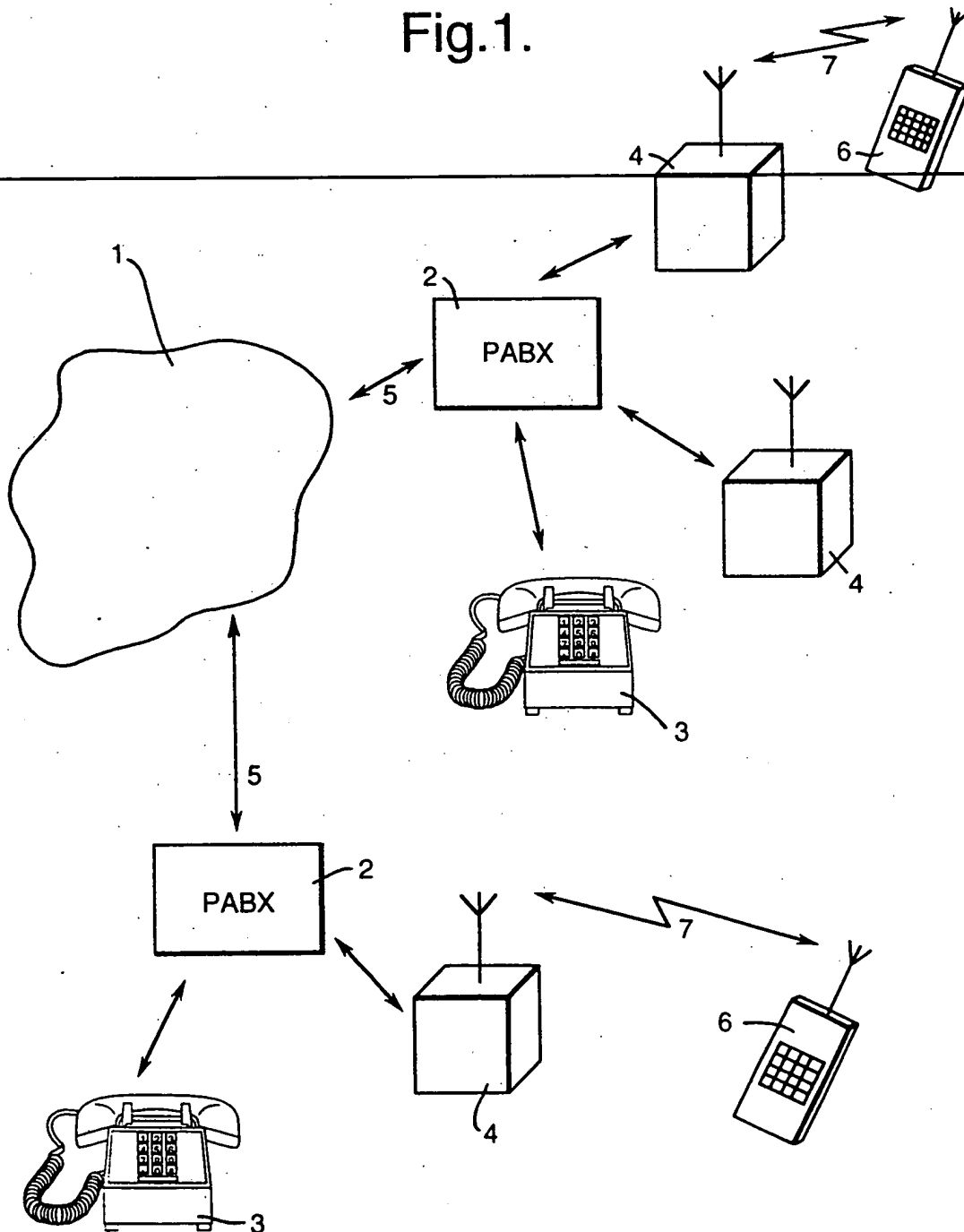
and connects the speech, or data, path to the new base-station in parallel with the first base-station. The PABX sends a **Handover Grant** message to the first base-station which transmits a **PAR_REQ** to the handset. Upon receiving a **PAR_RES** from the handset the first base-station ceases transmitting to the handset and sends a **Base-Station Idle** message,

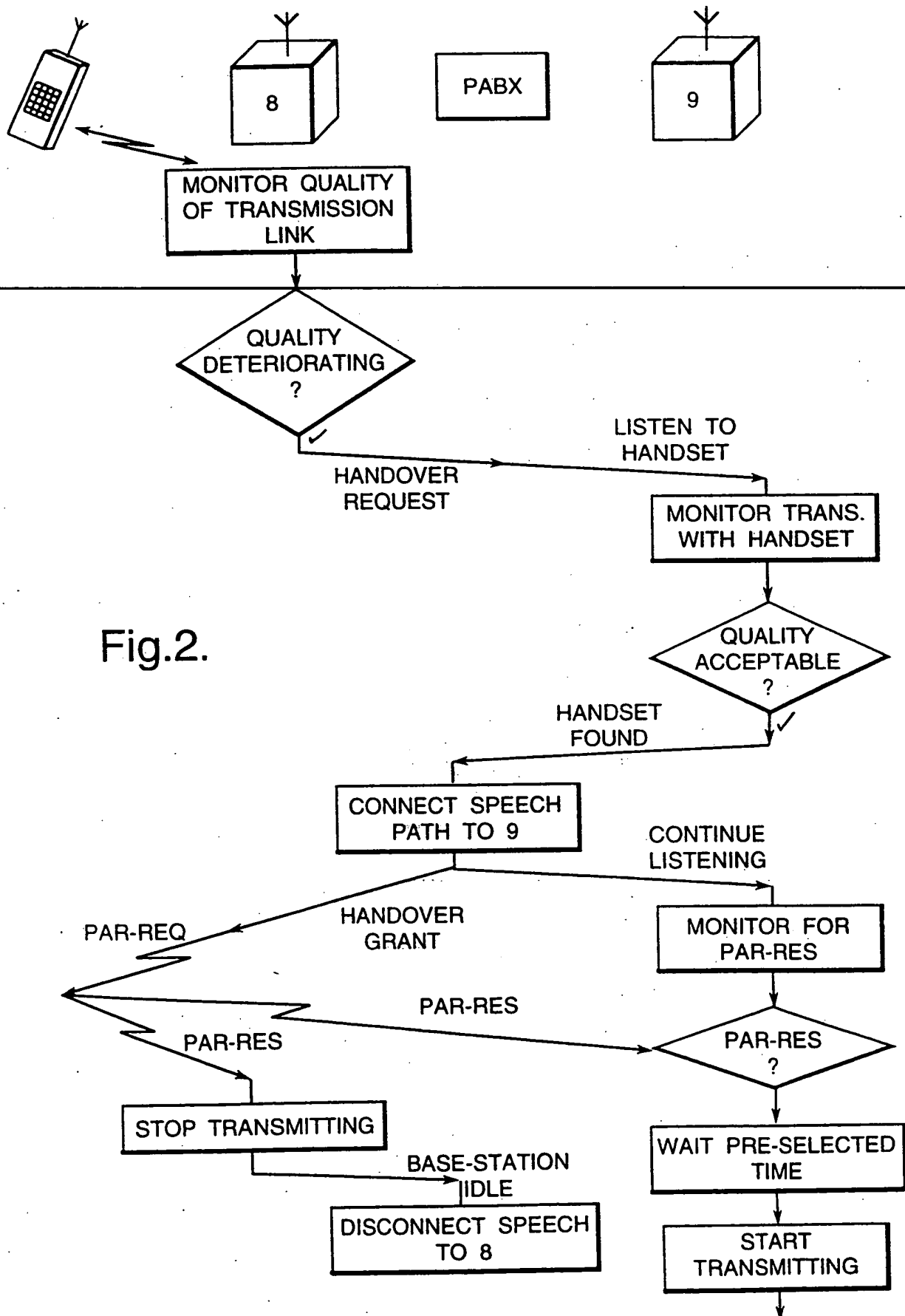
- 5 contain the **PID** to the PABX. The new base-station which is still monitoring transmissions from the handset upon detecting the **PAR_RES** pauses a pre-selected period, approximately 5mS, before transmitting data from the speech path to the handset thereby completing the handover sequence to the new base-station.

CLAIMS

1. In a cordless telecommunications system a method of transferring a call carried by a first radio link between a first base-station and a cordless handset, to one carried by a second radio link between a new base-station which is one of a plurality of frame
5 synchronised base-stations and the cordless handset, the base-stations being connected to a Private Automatic Branch Exchange PABX, comprising the steps of;
- (i) the first base-station monitoring the quality of the first radio link, and upon deterioration of the link sending a first message to the PABX,
 - (ii) the PABX upon receipt of the first message initiating monitoring of the quality of
10 radio transmissions from the cordless handset by the base-stations,
 - (iii) a new base-station detecting a radio link whose quality exceeds a predetermined value sending a second message to the PABX, and
 - (iv) the PABX connecting the call from the handset to the new base-station in parallel with the first base-station, and transferring transmission between the first and second radio
15 links.
2. A method according to Claim 1 in which the cordless telecommunications system operates according to I-ETSI 300 131 R1 and in which the transfer of transmission between the first and second radio links includes the first base-station transmitting a PAR_REQ to the cordless handset, in response the cordless handset transmitting a
20 PAR_RES, the first base-station ceasing transmission and the new base-station transmitting after a pre-selected delay.

Fig.1.





A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04Q H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	WO,A,94 05109 (MOTOROLA INC) 3 March 1994 see page 3, line 36 - page 4, line 16 see page 4, line 35 - page 5, line 20 see page 8, line 28 - page 9, line 2 see page 10, line 19 - line 23 see page 11, line 22 - page 12, line 33 see page 14, line 5 - line 36 ---	1
X,P	WO,A,94 19913 (AT & T WIRELESS COMMUNICATIONS ; BEESLEY GRAHAM EDGAR (GB)) 1 September 1994 see page 4, line 11 - line 32 see page 7, line 5 - line 9 see page 10, line 25 - page 11, line 11 see page 12, line 7 - line 15 see page 12, line 23 - line 32 see page 13, line 9 - page 15, line 31 see page 16, line 6 - line 31 --- -/--	1

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